



Suspended Ceiling Inspection Checklist

Seismic Design Categories D, E and F

The greater Puget Sound area falls under Seismic Design Category D, unless otherwise determined by a geological engineer in accordance with ASCE 7, as referenced in IBC 1613. Suspended-acoustical ceilings are to be installed in accordance with ASTM C635, ASTM C636, and the manufacturer’s installation instructions (IBC 808.1.1).

In addition to the manufacturer's specifications, Category D, E, and F ceilings are to be designed and installed according to ASTM E580 and to other requirements listed in ASCE 7-16 13.5.6.2.2, as referenced by IBC Section 1613.1. Requirements detailed in standards published after the date of this checklist may be considered as an alternate method when approved by the Building Official prior to installation. Please verify the following before calling for the ceiling-grid inspection.

Inspections

For permits approved under the 2018 IBC, any codes changes will be underlined.

IBC	2015	2018
ASCE 7	7-10	7-16
ASTM	C635, C636, E580	C635, C636, E580

Exceptions

For ceilings that fall under the exceptions in ASCE 7 13.5.6, seismic requirements do not apply.

1. Ceilings 144 square feet or less and surrounded by walls or soffits that connect directly to the structure above are exempt from the requirements in the pages that follow.
2. Suspended ceilings constructed of screw- or nail-attached gypsum board.

Note: Talk to your building inspector for requirements regarding these type of ceiling installations and refer to that system’s evaluation report.

Perimeter Supporting Angle

- Perimeter supporting angles shall have a horizontal flange of at least 2 inches. Unless otherwise required, the 2-inch supporting angle is required at the attached and unattached perimeters. (E580 5.2.2)
- Perimeter supporting clips may be used in lieu of the 2-inch perimeter supporting angle. When used, perimeter supporting clips shall be installed per their listing. When approved by the City of Bellevue prior to installation or where part of the suspending-ceiling listing, the contractor is responsible for providing a copy of the evaluation report at time of ceiling precon or ceiling inspection to verify proper installation. (7-16 13.5.6.2.2.a)
- The ceiling grid must be attached to perimeter supporting angle at two adjacent walls. (7-16 13.5.6.2.2.a; E580 5.2.3).
Note: Where ceilings are not attached to a wall, bracing is required. The objective of this section is to provide a restrained ceiling through either connection to the perimeter wall, or through bracing either rigid or non-rigid. Engineering must be reviewed and approved by the City of Bellevue.
- Unattached ends of the grid system have 3/4-inch minimum clearance from the wall, and rest on and are free to slide on the perimeter supporting angle or perimeter supporting clip. (7-10 13.5.6.2.2.a; 7-16 13.5.6.2.2.b)
- Perimeter supporting clips shall be attached to the perimeter supporting angle with a minimum of two screws per clip and shall be installed around the entire perimeter. Attach clips to wall with minimum (2) #8 steel screws. (7-16 13.5.6.2.2.b; COB Policy)

Hangers

- Suspension wires are minimum 12-gauge when spaced at four feet. (C636 2.1.6; E580 5.2.7.1)
- Hanger wire attachment devices can support 90 lbs. (E580 5.2.7.2)
- Connections at main runner and at structure are secured with a minimum of three full turns (360 degrees each) within a 3-inch length. (C636 2.3.4)
- Main runners are produced with round hanger wire holes in the tee web at regular intervals. There are also rectangular (convenience) holes located in the tee bulb at regular intervals. The typical location for the hanger and bracing (splay) wires is in the round holes. Unless allowed by the manufacturer, the rectangular (convenience) holes may not be used. (COB Policy)
- Wires are permitted to be supported by cold-rolled channel (CRC) when obstructions do not allow for the hanger wires to be directly attached to the supporting structure. CRC shall be minimum 16 gauge, 1-1/2-inches deep with 9/16-inch flanges. When the length of the CRC exceeds 5 feet, two CRC must be placed back-to-back and tied together with a double strand of 18-gauge steel wire at 24 inches on center. (COB Policy)

Perimeter Support

- Terminal ends of each main runner and cross tee are supported maximum 8 inches from each wall or ceiling discontinuity with 12-gauge wire or approved wall support. (E580 5.2.6)
- Wires are not hanged more than one in six out of plumb and may attach to the adjacent wall or to the structure above. (C636 2.1.4)
- Clips may not be used as alternate to the perimeter wires. (COB Policy)
- Connections at main runner and at structure are secured with a minimum of three full turns (360 degrees each) within a 3-inch length. (C636 2.3.4)

Perimeter Spacers

- Where not attached to the perimeter closure angle, ends of main runners and cross tees are tied together (using spreader bars or equivalent) to prevent spreading. (E580 5.2.4)
- Clips may be used in lieu of spreader bars when approved by the City of Bellevue prior to installation. (7-16 13.5.6.2.2.a)

Suspended Ceiling System

- With the use of an evaluation report, provided on site and available for the inspector at time of inspection, determine the duty classification of a grid system by the load-carrying capacity of the main runners and cross tees. (E580 5.1.1; C635 4.1.3)
- Main runner are heavy duty (i.e., they have a load-bearing capacity of 16 lbs./linear feet or greater). (E580 5.1.1; C635 4.1.3)
- Main-runner and cross-tee intersections and splices have connection strengths of a minimum 180 lbs. in compression and in tension. (E580 5.1.2)
- Cross tees supporting light fixtures have the same load carrying capacity as the main runners or are installed with supplemental hangers within 3 inches of each corner of each fixture supported by a cross tee. (E580 5.3.3) (See [Light Fixtures.](#))
- Cross tees supporting mechanical services have the same load carrying capacity as the main runner or are installed with supplemental hangers within three inches of each corner of each fixture supported by a cross tee.* (E580 5.3.3) (See [Mechanical Services.](#))

** The City of Bellevue has determined that it is acceptable practice to apply the same supplemental wire application, as is allowed for light fixtures, to mechanical services in addition to the requirements in the Mechanical Services portion of this checklist.*

Fire-Resistance Rated Suspended Ceilings

- A precon is required for fire-resistance rated suspended ceiling systems. (COB Policy)
- Provide a listed assembly by which the ceiling will be installed at time of ceiling precon or ceiling inspection to verify proper installation. (703.3)

General List for Fire-Resistance Rated Suspended Ceilings

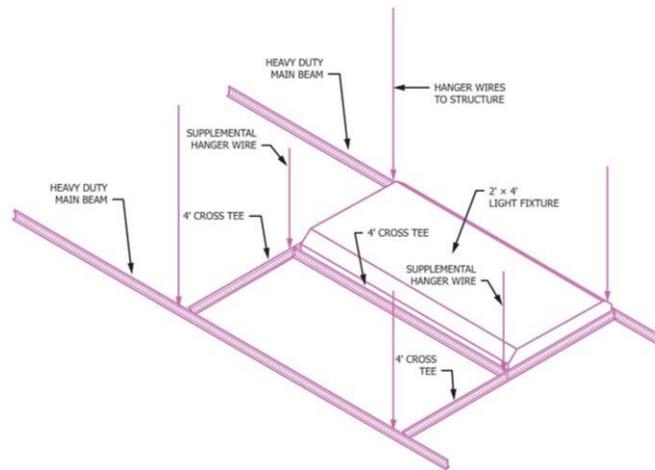
- Verify the listed assembly or evaluation report (ESR) for the grid system that closely resembles the existing system (e.g., Armstrong ESR 1308, USG ESR 1222, etc.).
- Main runners must have vertical support hanger wires within 3 inches of the main runner fire expansion relief.
- Hanger wires must occur at all four corners of light fixtures, at midspan of cross tees adjacent to 4-foot light fixtures and air duct outlets, and adjacent to each main runner splice.
- The total area of duct openings must not exceed the area indicated in the listed assembly or evaluation report per each 100 square feet of ceiling area. The maximum opening dimension shall be per the assembly or the evaluation report.
- The spacing and supports of the air duct shall be per the assembly or the evaluation report.
- Duct openings are protected with ceiling radiation dampers or as required by the mechanical inspector. [713.10; 713.11; 713.12]
- Ceiling penetrations are fire-stopped above the grid at the tile penetration(s), including but not limited to those originating from partition walls. [710.3]
- Light fixtures must be spaced so that their total area does not exceed the area indicated in the listed assembly or evaluation report per each 100 square feet of ceiling area.
- Protect light fixtures and other penetrations, such as speakers, by following the listed assembly or evaluation services report. If these are not available, follow the prescriptive methods in the pages that follow.
- Also see the section for [Light Fixtures](#) and [Mechanical Services](#).
- Penetrations through fire-resistance rated suspended ceilings are required to be firestopped, including but not limited to, electrical wires, wall bracing, low voltage conduits, plumbing, etc.
- Be sure that any replacement tiles are fire-resistance rated tiles.

Lateral Force Bracing

- Ceiling areas greater than 1,000 square feet have lateral force bracing. (E580 5.2.8)
- Rigid bracing that limits lateral deflections to less than 1/4 inches may be used instead of diagonal splay wires. (E580 5.2.8.4)
- Splay wire bracing is in clusters of four 12-gauge wires attached to the main runner within two inches of the cross-tee intersection. Wires are arrayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. (E580 5.2.8.2)
- A strut, with stiffness adequate to resist the vertical loads imposed, is attached to the suspension system and to the structure above at each bracing location (E580 5.2.8.2).
- Install struts specified by the manufacturer for proprietary systems, provide an engineered strut system, or select an approved strut from [Table 1](#). (COB Policy)
- Attach strut to main runner with minimum (2) #8 self-drilling, self-tapping steel screws and to structure with (2) #6 wood screws, single shot pin, or (2) #8 self-drilling, self-tapping steel screws per construction conditions. (This does not apply to conduit-type struts.) (COB Policy)
- Horizontal-restraint points (i.e., struts) are installed no more than 12 feet on center in each direction and along main runners. The first strut must be within 6 feet of each wall, unless otherwise required. (E580 5.2.8.2)
- Attachment of the bracing wires to the main runner and to the structure can support a load of not less than 250 lbs. (E580 5.2.8.3)
- Bracing members are spaced a minimum of 6 inches from all horizontal piping or duct work that is not provided with bracing restraints for horizontal forces. (E580 5.2.8.3)

Light fixtures

- All fixtures are positively attached to the suspension system. The attachment device is able to withstand 100 percent of the weight of the fixture acting in any direction. (E580 5.3.1)
- Cross runners supporting the ends of lighting have the same carrying capacity (i.e., 16lb./linear foot) as the main runners or require supplemental 12-gauge hanger wires attached to the grid members within three inches of each corner of each fixture supported by a cross tee (see the image below). (ASTM E580 5.3.3)



(Source: ASTM E580 – Figure 8. Supplemental Hanger Wires at Light Fixtures)

- Fixtures weighing less than or equal to 10 lbs. shall have one 12-gauge wire. This wire may be slack. (E580 5.3.5)
- Fixtures weighing more than 10 lbs. but less than 56 lbs. shall have two 12-gauge wires attached at diagonal corners. These wires may be slack. (E580 5.3.5)
- Fixtures weighing in excess of 56 lbs. are independently supported from the building structure. (E580 5.3.6)
- Pendant mounted fixtures are supported directly from the structure using 9-gauge wires. They may not use the ceiling suspension system for support. (E580 5.3.7)

Mechanical Services

Mechanical services weighing less than or equal to 20 lbs. are positively attached to the suspension system main runners or to cross tees with the same load carrying capacity.* These wires may be slack. (E580 5.4.1)

* *Where cross tees don't have the same carrying capacity as the main runners, attach supplemental 12-gauge hanger wires to the grid members within three inches of each corner of each fixture supported by a cross tee. (COB Policy)*

- Terminals or services weighing more than 20 lbs. but less than or equal to 56 lbs. shall have two 12-gauge wires connecting them to the ceiling-system hangers or to the structure above. These wires may be slack. (E580 5.4.2)
- Terminals or services weighing more than 56 lbs. are independently supported. (E580 5.4.3)

Flexible Sprinkler Hose Fittings

- Flexible sprinkler hose fittings weighing less than or equal to 20 lbs. shall be positively attached to the ceiling main runners or to cross tees that have the same carrying capacity as the main runners. (E580 5.4.1)
- Flexible sprinkler hose fittings weighing 20 lbs. to 56 lbs. must have two 12-gauge wires connecting them to the ceiling-system hangers or to the structure above. (E580 5.4.2)

Partition Attachment

- Partitions attached to the ceiling suspension system are laterally braced to the building structure. This bracing is independent of any ceiling's splay-wire bracing. (1607.14)
- Attached partitions cannot cross seismic-separation joints. (1607.14)

Penetrations

- Ceilings without rigid bracing shall have 2-inch oversized trim rings to allow 1-inch horizontal movement in all horizontal directions at sprinkler heads and other penetrations. Alternatively, a swing joint that can accommodate one inch of ceiling movement in all horizontal directions at the top of the sprinkler head extension. (E580 5.2.8.5)

Seismic Separation Joints

- Ceiling areas greater than 2,500 square feet have seismic-separation joints or full-height partitions unless analyses are performed to demonstrate that the closure trims and angles provide enough clearance to accommodate the additional ceiling movement. Each area to provide 3/4-inch clearance as detailed above, under [Perimeter Supporting Angle](#). Refer to the manufacturer for seismic-separation joint or provide alternate system to the city for review. (7-10 & 7-16 13.5.6.2.2.b; E580 5.2.9.1)
- Horizontal-restraint points (i.e., struts) are required within 6 feet of the joint, as if it were a stand-alone ceiling. (E580 5.2.8.2)
- Perimeter wires and/or hanger wires are required at each side of the seismic-separation joint, as if it were a stand-alone ceiling. (E580 5.2.6)
- Maintain connection of grid to two adjacent walls as noted under the [Perimeter Supporting Angle](#) section. Where multiple seismic-separation joints create a condition where a wall connection is not possible, lateral-force bracing, or equivalent will be provided to satisfy the adjacent wall requirement. (7-10 & 7-16 13.5.6.2.2.b)
- Perimeter spacers (spreader bars) or equivalent are installed at either side of joint. (E580 5.2.4)

Height Transitions

- Changes in ceiling plane elevation shall have positive bracing and may require engineering, which must be reviewed and approved by the City of Bellevue. (E580 5.2.8.6)

Exterior Ceiling Systems

- Most ceilings are evaluated for use in interior applications. For exterior ceiling systems, those systems must be designed for wind loads and with due consideration of atmospheric conditions. These systems must be reviewed and approved by the engineer of record (EOR) and then submitted and approved by COB prior to installation. (Evaluation Reports; COB Policy)

Plenums

- No combustibles in plenums used for return air (e.g., plastic plumbing pipe, insulation with exposed facing, non-fire-resistant treated wood, etc.). (COB Policy)

Draftstopping

- Unless the building is equipped with a fire sprinkler system, in other than Group R occupancies, draftstopping shall be installed to subdivide combustible floor/ceiling assemblies so that horizontal floor areas do not exceed 1,000 square feet. (IBC 718.3)
 - Unless the building is equipped with a fire sprinkler system, in other than Group R, draftstopping shall be installed to subdivide combustible attic spaces and combustible concealed roof spaces such that any horizontal area does not exceed 3,000 square feet. (IBC 718.4)
 - For Type I and Type II construction, draftstopping materials shall be not less than 1/2-inch gypsum board, cement fiberboard, batts or blankets of mineral wool or glass fiber, or other approved materials adequately supported. The integrity of draftstops shall be maintained. (IBC 718.3.1)
 - For Type III, IV, and V construction, draftstopping materials shall be not less than 1/2-inch gypsum board, 3/8-inch wood structural panel, 3/8-inch particleboard, 1-inch nominal lumber, cement fiberboard, batts or blankets of mineral wool or glass fiber, or other approved materials adequately supported. The integrity of draftstops shall be maintained. (IBC 718.3.1)
- Ensure that the draftstopping is as close as possible to the ceiling tiles. (COB Policy)

Marking and Identification of Fire-Resistance Rated Walls Above Ceilings

- Per IBC 703.7, where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space. Such identification shall:
 - Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
 - Include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in a contrasting color incorporating the suggested wording, "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other wording.

Exception: See COB's Policy for smaller size characters.

Concealed Insulation

- Per IBC 720.2, insulating materials, where concealed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

Miscellaneous

- Remove construction debris from the ceiling. Where unused items, including but not limited to wires, wall bracing, mechanical, electrical, plumbing, etc., hinder the inspection, these items may be required to be removed at the discretion of the inspector. (COB Policy)

Electrical Wiring, Conduits, and Cable Trays

- Electrical wiring, conduits, and cable trays are independently supported and braced independently of the ceiling. (NEC 392.20, 300.11(A)&(B); WCEC 300.11(A)1-10)

Working Clearances

- Coordinate with electrical and mechanical inspectors for location and clearance requirements for electrical and mechanical equipment and disconnects. (COB Policy)
- Install removeable cross tees and label them "Removable Cross Tee" where installed within the clear working space. (COB Policy)

Table 1
Maximum Compression Strut Lengths for 180 lb. Seismic Load

Material	Length
¾ inch X ½ inch X 0.059-inch Channel	26 inches
1½ inch X 9/16-inch X 0.059-inch Channel	33 inches
(2) ¾ inch X ½ inch X 0.059-inch Channel, Back to Back	39 inches
(2) 1½ inch X 9/16-inch X 0.059-inch Channel, Back to Back	44 inches
1-5/8 inch X 1¼ inch X 0.0197-inch Channel	106 inches
(2) 1-5/8 inches X 1¼ inches X 0.0197-inch Channel, Back to Back	120 inches
½ inch Diameter EMT Conduit, 0.042-inch Wall Thickness	47 inches
¾ inch Diameter EMT Conduit, 0.049-inch Wall Thickness	61 inches
1-inch Diameter EMT Conduit, 0.057-inch Wall Thickness	78 inches
1¼ inch Diameter EMT Conduit, 0.065-inch Wall Thickness	102 inches
1½ inch Diameter EMT Conduit, 0.065-inch Wall Thickness	120 inches
Engineering is required for struts longer than 120 inches and is to include the maximum height, type of material, and the connection to the grid and structure above.	-